

---

# ANNALS OF BOTANY

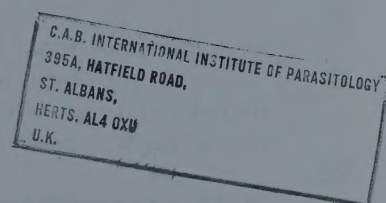
---

Founded 1887

---

Volume 69 (January to June) 1992

---



**Academic Press**

*Harcourt Brace Jovanovich, Publishers*

London San Diego New York Boston Sydney Tokyo Toronto

Copyright © 1992 Annals of Botany Company

ALL RIGHTS RESERVED

No part of this volume may be reproduced in any  
form, by photostat, microfilm or any other means,  
without written permission from the publishers

ISSN 0305-7364

# CONTENTS

Volume 69

Number 1	January 1992
Oliveira, L. M. Q. and Valio, I. F. M. Effects of Moisture Content on Germination of Seeds of <i>Hancornia speciosa</i> Gom. (Apocynaceae)	1
Sharma, N., Koul, P. and Koul, A. K. Reproductive Biology of <i>Plantago</i> : Shift from Cross- to Self-pollination	7
Midmore, D. J. and Prange, R. K. Growth Responses of Two <i>Solanum</i> Species to Contrasting Temperatures and Irradiance Levels: Relations to Photosynthesis, Dark Respiration and Chlorophyll Fluorescence	13
Davies, K. L., Davies, M. S. and Francis, D. Zinc-induced Vacuolation in Root Meristematic Cells of Cereals	21
Petruzzelli, L., Melillo, M. T., Zacheo, T. B. and Taranto, G. Physiological and Ultrastructural Changes in Isolated Wheat Embryos During Salt and Osmotic Shock	25
Jupe, S. C. and Scott, I. M. Gibberellin and the <i>pro</i> Gene Suppress Peroxidase Activity in Elongating Tomato ( <i>Lycopersicon esculentum</i> Mill.) Stem Tissues	33
Dawidowicz-Grzegorzewska, A. and Podstolski, A. Age-related Changes in the Ultrastructure and Membrane Properties of <i>Brassica napus</i> L. Seeds	39
Kamaluddin, M. and Grace, J. Photoinhibition and Light Acclimation in Seedlings of <i>Bischofia javanica</i> , a Tropical Forest Tree from Asia	47
Ellis, R. H., Hong, T. D. and Roberts, E. H. The Low-moisture-content Limit to the Negative Logarithmic Relation Between Seed Longevity and Moisture Content in Three Subspecies of Rice	53
Peterson, C. M., Mosjidis, C. O'H, Dute, R. R. and Westgate, M. E. A Flower and Pod Staging System for Soybean	59
Pilbeam, C. J. and Robson, M. J. Response of Populations of <i>Lolium perenne</i> cv. S 23 with Contrasting Rates of Dark Respiration to Nitrogen Supply and Defoliation Regime. 1. Grown as Monocultures	69
Pilbeam, C. J. and Robson, M. J. Response of Populations of <i>Lolium perenne</i> cv. S 23 with Contrasting Rates of Dark Respiration to Nitrogen Supply and Defoliation Regime. 2. Grown as Mixtures	79
Alm, D. M., Cavelier, J. and Nobel, P. S. A Finite-element Model of Radial and Axial Conductivities for Individual Roots: Development and Validation for Two Desert Succulents	87
Book Review	93
Erratum	95

Number 2	February 1992
Zhou, X., Han, Y., Yang, W. and Xi, T. Somatic Embryogenesis and Analysis of Peroxidase in Cultured Lettuce ( <i>Lactuca sativa</i> L.) Cotyledons	97
Summerfield, R. J., Collinson, S. T., Ellis, R. H., Roberts, E. H. and Penning De Vries, F. W. T. Photothermal Responses of Flowering in Rice ( <i>Oryza sativa</i> )	101



<b>Ueda, K. and Nonaka, M.</b> Division of Chloroplasts in a Green Alga, <i>Pediastrum duplex</i>	113
<b>Shi, L. and Cline, M.</b> Shoot Inversion-induced Ethylene Production in the <i>Diageotropa</i> Tomato Mutant	119
<b>Sanders, G. E., Colls, J. J. and Clark, A. G.</b> Physiological Changes in <i>Phaseolus vulgaris</i> in Response to Long-term Ozone Exposure	123
<b>Warren Wilson, J., Warren Wilson, P. M., Walker, E. S. and Hall, P. J.</b> IAA Amino Acid Conjugates Induce Differentiation of Tracheary Strands in Lettuce Pith Explants	135
<b>Kavi Kishor, P. B., Rao, J. D. and Reddy, G. M.</b> Activity of Wall-bound Enzymes in Callus Cultures of <i>Gossypium hirsutum</i> L. During Growth	145
<b>Lanning, F. C. and Eleuterius, L. N.</b> Silica and Ash in Seeds of Cultivated Grains and Native Plants	151
<b>Mac An t-Saoir, S., O'Brien, J. and Selby, C.</b> The Effect of Explant Type on the Establishment of Sitka Spruce [ <i>Picea sitchensis</i> (Bong.) Carr.] in Culture	161
<b>Dell'Aquila, A.</b> Water Uptake and Protein Synthesis in Germinating Wheat Embryos under the Osmotic Stress of Polyethylene Glycol	167
<b>James, E. K., Sprent, J. I., Sutherland, J. M., McInroy, S. G. and Minchin, F. R.</b> The Structure of Nitrogen Fixing Root Nodules on the Aquatic Mimosoid Legume <i>Neptunia plena</i>	173
<b>James, E. K., Minchin, F. R. and Sprent, J. I.</b> The Physiology and Nitrogen-fixing Capability of Aquatically and Terrestrially Grown <i>Neptunia plena</i> : The Importance of Nodule Oxygen Supply	187
<b>Book Reviews</b>	189

### Number 3

March 1992

<b>Rao, G. U., Jain, A. and Shivanna, K. R.</b> Effects of High Temperature Stress on <i>Brassica</i> Pollen: Viability, Germination and Ability to Set Fruits and Seeds	193
<b>McKenzie, R. J. and Lovell, P. H.</b> Perianth Abscission in Montbretia ( <i>Crocasmia × crocosmiiflora</i> )	199
<b>Clifford, P. E., Neo, H. H. and Hew, C. S.</b> Partitioning of <sup>14</sup> C-Assimilate Between Sources and Sinks in the Monopodial Orchid <i>Aranda</i> Tay Swee Eng	209
<b>Flood, R. G., Lagudah, E. S. and Halloran, G. M.</b> Expression of Vernalization Requirement and Spikelet Number in Synthetic Hexaploid Wheats and their <i>Triticum tauschii</i> and Tetraploid Wheat Parents	213
<b>Bonnett, G. D. and Incoll, L. D.</b> The Potential Pre-anthesis and Post-anthesis Contributions of Stem Internodes to Grain Yield in Crops of Winter Barley	219
<b>Herdina and Silsbury, J. H.</b> Nodulation and Nitrogen Fixation of Faba Bean ( <i>Vicia faba</i> L.) as Affected by Removal of the Cotyledons and Nitrate Supply	227
<b>Bino, R. J., De Vries, J. N., Kraak, H. L. and Van Pijlen, J. G.</b> Flow Cytometric Determination of Nuclear Replication Stages in Tomato Seeds during Priming and Germination	231
<b>Dathe, W.</b> Effects of Jasmonic Acid and Ethephon on Tillering to Maturity in Spring Barley	237

<b>Griffith, S. M.</b> Changes in Post-anthesis Assimilates in Stem and Spike Components of Italian Ryegrass ( <i>Lolium multiflorum</i> Lam.). I. Water Soluble Carbohydrates	243
<b>Sattler, R. and Jeune, B.</b> Multivariate Analysis Confirms the Continuum View of Plant Form	249
<b>Dute, R. R. and Peterson, C. M.</b> Early Endosperm Development in Ovules of Soybean, <i>Glycine max</i> (L.) Merr. (Fabaceae)	263
<b>Shanmuganathan, V. and Benjamin, L. R.</b> The Influence of Sowing Depth and Seed Size on Seedling Emergence Time and Relative Growth Rate in Spring Cabbage ( <i>Brassica oleracea</i> var. capitata L.)	273
<b>Smith, M. T., Saks, Y. and Van Staden, J.</b> Ultrastructural Changes in the Petals of Senescing Flowers of <i>Dianthus caryophyllus</i> L.	277
<b>Book Reviews</b>	287

<b>Number 4</b>	<b>April 1992</b>
<b>Aamlid, T. S.</b> Effects of Temperature and Photoperiod on Growth and Development of Tillers and Rhizomes in <i>Poa pratensis</i> L. Ecotypes	289
<b>Kovach, D. A. and Bradford, K. J.</b> Temperature Dependence of Viability and Dormancy of <i>Zizania palustris</i> var. <i>interior</i> Seeds Stored at High Moisture Contents	297
<b>Kagan, M. L., Novoplansky, N. and Sachs, T.</b> Variable Cell Lineages form the Functional Pea Epidermis	303
<b>Serrato-Valenti, G., Cornara, L., Lotito, S. and Quagliotti, L.</b> Seed Coat Structure and Histochemistry of <i>Abelmoschus esculentus</i> . Chalazal Region and Water Entry	313
<b>El Hadrami, I. and D'Auzac, J.</b> Effects of Growth Regulators on Polyamine Content and Peroxidase Activity in <i>Hevea brasiliensis</i> Callus	323
<b>Kull, U., Herbig, A. and Otto, F.</b> Construction and Economy of Plant Stems as Revealed by Use of the <i>Bic</i> -method	327
<b>Maceira, N. O., De Haan, A. A., Lumaret, R., Billon, M. and Delay, J.</b> Production of $2n$ Gametes in Diploid Subspecies of <i>Dactylis glomerata</i> L. 1. Occurrence and Frequency of $2n$ Pollen	335
<b>De Haan, A., Maceira, N. O., Lumaret, R. and Delay, J.</b> Production of $2n$ Gametes in Diploid Subspecies of <i>Dactylis glomerata</i> L. 2. Occurrence and Frequency of $2n$ Eggs	345
<b>Jernstedt, J. A., Cutter, E. G., Gifford, E. M. and Lu, P.</b> Angle Meristem Origin and Development in <i>Selaginella martensii</i>	351
<b>Lyshede, O. B.</b> Studies on Mature Seeds of <i>Cuscuta pedicellata</i> and <i>C. campestris</i> by Electron Microscopy	365
<b>Book Reviews</b>	373

<b>Number 5</b>	<b>May 1992</b>
<b>Zheng, Y., He, M., Hao, S. and Huang, B.</b> The Ultrastructural Evidence on the Origin of Protein Bodies in the Rough Endoplasmic Reticulum of Developing Cotyledons of Soybean	377



<b>Heslop-Harrison, Y. and Heslop-Harrison, J.</b> Germination of Monocolpate Angiosperm Pollen: Evolution of the Actin Cytoskeleton and Wall during Hydration, Activation and Tube Emergence	385
<b>Heslop-Harrison, J. and Heslop-Harrison, Y.</b> Germination of Monocolpate Angiosperm Pollen: Effects of Inhibitory Factors and the $\text{Ca}^{2+}$ -Channel Blocker, Nifedipine	395
<b>Bargali, S. S., Singh, S. P. and Singh, R. P.</b> Structure and Function of an Age Series of Eucalypt Plantations in Central Himalaya. I. Dry Matter Dynamics	405
<b>Bargali, S. S., Singh, S. P. and Singh, R. P.</b> Structure and Function of an Age Series of Eucalypt Plantations in Central Himalaya. II. Nutrient Dynamics	413
<b>LaLonde, S. and Saini, H. S.</b> Comparative Requirement for Endogenous Ethylene during Seed Germination	423
<b>Marriott, C. A. and Haystead, A.</b> The Effect of Lenient Defoliation on the Nitrogen Economy of White Clover: The Contribution of Mineral Nitrogen to Plant Nitrogen Accumulation during Regrowth	429
<b>Pennazio, S. and Roggero, P.</b> Effects of Free Radical Scavengers on Stress Ethylene in Soybean Leaves Hypersensitively Reacting to Tobacco Necrosis Virus	437
<b>Pearce, D. M. E., Hall, K. C. and Jackson, M. B.</b> The Effects of Oxygen, Carbon Dioxide and Ethylene on Ethylene Biosynthesis in Relation to Shoot Extension in Seedlings of Rice ( <i>Oryza sativa</i> ) and Barnyard Grass ( <i>Echinochloa oryzoides</i> )	441
<b>Venkaiah, K.</b> Development, Ultrastructure and Secretion of Gum Ducts in <i>Lannea coromandelica</i> (Houtt.) Merrill ( <i>Anacardiaceae</i> )	449
<b>Muralitharan, M. S., Chandler, S. F. and Van Steveninck, R. F. M.</b> Effects of $\text{Na}_2\text{SO}_4$ , $\text{K}_2\text{SO}_4$ and KCl on Growth and Ion Uptake of Callus Cultures of <i>Vaccinium corymbosum</i> L. cv. Blue Crop	459
<b>Rafi, M. M., Ehdaie, B. and Waines, J. G.</b> Quality Traits, Carbon Isotope Discrimination and Yield Components in Wild Wheats	467
<b>Book Reviews</b>	475
<b>Erratum</b>	479

## Number 6

June 1992

<b>Lorenzen, J. H. and Ewing, E. E.</b> Starch Accumulation in Leaves of Potato ( <i>Solanum tuberosum</i> L.) during the First 18 Days of Photoperiod Treatment	481
<b>Marcelis, L. F. M.</b> The Dynamics of Growth and Dry Matter Distribution in Cucumber	487
<b>Pardales, J. R., Jr, Kono, Y., Yamauchi, A. and Iijima, M.</b> Seminal Root Growth in Sorghum ( <i>Sorghum bicolor</i> ) Under Allelopathic Influences from Residues of Taro ( <i>Colocasia esculenta</i> )	493
<b>Das, G. and Sen-Mandi, S.</b> Scutellar Amylase Activity in Naturally Aged and Accelerated Aged Wheat Seeds	497
<b>Tirlapur, U. K. and Cresti, M.</b> Computer-assisted Video Image Analysis of Spatial Variations in Membrane-associated Ca and Calmodulin during Pollen Hydration, Germination and Tip Growth in <i>Nicotiana tabacum</i> L.	503

<b>Hara, T.</b> Effects of the Mode of Competition on Stationary Size Distribution in Plant Populations	509
<b>Davies, A. and Jones, D. R.</b> The Production of Leaves and Stolon Branches on Established White Clover Cuttings in Relation to Temperature and Soil Moisture in the Field	515
<b>Chapman, D. F., Robson, M. J., Snaydon, R. W. and Caradus, J. R.</b> The Growth and Carbon Allocation Patterns of White Clover ( <i>Trifolium repens</i> L.) Plants of Contrasting Branching Structure	523
<b>Barlow, P. W.</b> The Meristem and Quiescent Centre in Cultured Root Apices of the <i>gib-1</i> Mutant of Tomato ( <i>Lycopersicon esculentum</i> Mill.)	533
<b>Hemsley, A. R., Chaloner, W. G., Scott, A. C. and Groombridge, C. J.</b> Carbon-13 Solid-state Nuclear Magnetic Resonance of Sporopollenins from Modern and Fossil Plants	545
<b>Kahane, R., Teyssendier de la Serve, B. and Rancillac, M.</b> Bulbing in Longday Onion ( <i>Allium cepa</i> L.) Cultured <i>In Vitro</i> : Comparison Between Sugar Feeding and Light Induction	551
<b>Kamaluddin, M. and Grace, J.</b> Acclimation in Seedlings of a Tropical Tree, <i>Bischofia javanica</i> , Following a Stepwise Reduction in Light	557
<b>Ryle, G. J. A. and Stanley, J.</b> Effect and Elevated CO <sub>2</sub> on Stomatal Size and Distribution in Perennial Ryegrass	563
<b>Book Reviews</b>	567





## Author Index

- AAMLID, T. S., Effects of temperature and photoperiod on growth and development of tillers and rhizomes in *Poa pratensis* L. ecotypes, 289
- ALM, D. M., CAVELIER, J. & NOBEL, P. S., A finite-element model of radial and axial conductivities for individual roots: development and validation for two desert succulents, 87
- BARGALI, S. S., SINGH, S. P. & SINGH, R. P., Structure and function of an age series of eucalypt plantations in Central Himalaya. I. Dry matter dynamics, 405
- , SINGH, R. P., SINGH, S. P., Structure and function of an age series of eucalypt plantations in Central Himalaya. II. Nutrient dynamics, 413
- BARLOW, P. W., The meristem and quiescent centre in cultured root apices of the *gib-1* mutant of tomato (*Lycopersicon esculentum* Mill.), 533
- BENJAMIN, L. R. (see SHANMUGANATHAN, V.), 273
- BILLON, M. (see MACEIRA, N. O.), 335
- BINO, R. J., DE VRIES, J. N., KRAAK, H. L. & VAN PIJLEN, J. G., Flow cytometric determination of nuclear replication stages in tomato seeds during priming and germination, 231
- BLEVE ZACHEO, T. (see PETRUZZELLI, L.), 25
- BONNETT, G. D. & INCOLL, L. D., The potential pre-anthesis and post-anthesis contributions of stem internodes to grain yield in crops of winter barley, 219
- BRADFORD, K. J. (see KOVACH, D. A.), 297
- CARADUS, J. R. (see CHAPMAN, D. F.), 523
- CAVELIER, J. (see ALM, D. M.), 87
- CHALONER, W. G. (see HEMSLEY, A. R.), 545
- CHANDLER, S. F. (see MURALITHARAN, M. S.), 459
- CHAPMAN, D. F., ROBSON, M. J., SNAYDON, R. W. & CARADUS, J. R., The growth and carbon allocation patterns of white clover (*Trifolium repens* L.) plants of contrasting branching structure, 523
- CLARK, A. G. (see SANDERS, G. E.), 123
- CLIFFORD, P. E., NEO, H. H. & HEW, C. S., Partitioning of  $^{14}\text{C}$ -assimilate between sources and sinks in the monopodial orchid *Aranda* Tay Sweet Eng, 209
- CLINE, M. (see SHI, L.), 119
- COLLINSON, S. T. (see SUMMERFIELD, R. J.), 101
- COLLS, J. J. (see SANDERS, G. E.), 123
- CORNARA, L. (see SERRATO-VALENTI, G.), 313
- CRESTI, M. (see TIRLAPUR, U. K.), 503
- CUTTER, E. G. (see JERNSTEDT, J. A.), 351
- DAS, G. & SEN-MANDI, S., Scutellar amylase activity in naturally aged and accelerated aged wheat seeds, 497
- DATHE, W., Effects of jasmonic acid and ethephon on tillering to maturity in spring barley, 237
- D'AUZAC, J. (see EL HADRAMI, I.), 323
- DAVIES, A. & JONES, D. R., The production of leaves and stolon branches on established white clover cuttings in relation to temperature and soil moisture in the field, 515
- DAVIES, K. L., DAVIES, M. S. & FRANCIS, D., Zinc-induced vacuolation in root meristematic cells of cereals, 21
- DAVIES, M. S. (see DAVIES, K. L.), 21
- DAWIDOWICZ-GRZEGORZEWSKA, A. & PODSTOLSKI, A., Age-related changes in the ultrastructure and membrane properties of *Brassica napus* L. seeds, 39
- DE HAAN, A., MACEIRA, N. O., LUMARET, R. & DELAY, J., Production of  $2n$  gametes in diploid subspecies of *Dactylis glomerata* L. 2. Occurrence and frequency of  $2n$  eggs, 345
- DE HAAN, A. A. (see MACEIRA, N. O.), 335
- DELAY, J. (see MACEIRA, N. O.), 335
- , (see DE HAAN, A.), 345
- DELL'AQUILA, A., Water uptake and protein synthesis in germinating wheat embryos under the osmotic stress of polyethylene glycol, 167
- DE VRIES, J. N. (see BINO, R. J.), 231
- DIVAKAR RAO, J. (see KAVI KISHOR, P. B.), 145
- DUTE, R. R. (see PETERSON, C. M.), 59
- , PETERSON, C. M., Early endosperm development in ovules of soybean, *Glycine max* (L.) Merr. (Fabaceae), 263
- EHDIAE, B. (see RAFI, M. M.), 467
- ELEUTERIUS, L. N. (see LANNING, F. C.), 151
- EL HADRAMI, I. & D'AUZAC, J., Effects of growth regulators on polyamine content and peroxidase activity in *Hevea brasiliensis* callus, 323
- ELLIS, R. H., HONG, T. D. & ROBERTS, E. H., The low-moisture-content limit to the negative logarithmic relation between seed longevity and moisture content in three subspecies of rice, 53
- , (see SUMMERFIELD, R. J.), 101
- EWING, E. E. (see LORENZEN, J. H.), 481
- FLOOD, R. G., LAGUDAH, E. S. & HALLORAN, G. M., Expression of vernalization requirement and spikelet number in synthetic hexaploid wheats and their *Triticum tauschii* and tetraploid wheat parents, 213
- FRANCIS, D. (see DAVIES, K. L.), 21
- GIFFORD, E. M. (see JERNSTEDT, J. A.), 351
- GRACE, J. (see KAMALUDDIN, M.), 47, 557
- GRIFFITH, S. M., Changes in post-anthesis assimilates in stem and spike components of Italian ryegrass (*Lolium multiflorum* Lam.). I. Water soluble carbohydrates, 243
- GROOMBRIDGE, C. J. (see HEMSLEY, A. R.), 545

- HALL, K. C. (see PEARCE, D. M. E.), 441  
 HALL, P. J. (see WARREN WILSON, J.), 135  
 HALLORAN, G. M. (see FLOOD, R. G.), 213  
 HAN, Y. (see ZHOU, X.), 97  
 HAO, S. (see ZHENG, Y.), 377  
 HARA, T., Effects of the mode of competition on stationary size distribution in plant populations, 509  
 HAYSTEAD, A. (see MARRIOTT, C. A.), 429  
 HE, M. (see ZHENG, Y.), 377  
 HEMSLEY, A. R., CHALONER, W. G., SCOTT, A. C. & GROOMBRIDGE, C. J., Carbon-13 solid-state nuclear magnetic resonance of sporopollenins from modern and fossil plants, 545  
 HERBIG, A. (see KULL, U.), 327  
 HERDINA, & SILSBURY, J. H., Nodulation and nitrogen fixation of faba bean (*Vicia faba* L.) as affected by removal of the cotyledons and nitrate supply, 277  
 HESLOP-HARRISON, J. (see HESLOP-HARRISON, Y.), 385  
 —, HESLOP-HARRISON, Y., Germination of monocarpate angiosperm pollen: effects of inhibitory factors and the  $\text{Ca}^{2+}$ -channel blocker, nifedipine, 395  
 HESLOP-HARRISON, Y. & HESLOP-HARRISON, J., Germination of monocarpate angiosperm pollen: evolution of the actin cytoskeleton and wall during hydration, activation and tube emergence, 385  
 —, (see HESLOP-HARRISON, J.), 395  
 HEW, C. S. (see CLIFFORD, P. E.), 209  
 HONG, T. D. (see ELLIS, R. H.), 53  
 HUANG, B. (see ZHENG, Y.), 377  
 IJIMA, M. (see PARDALES, J. R., Jr), 493  
 INCOLL, L. D. (see BONNETT, G. D.), 219  
 JACKSON, M. B. (see PEARCE, D. M. E.), 441  
 JAIN, A. (see RAO, G. U.), 193  
 JAMES, E. K., SPRENT, J. I., SUTHERLAND, J. M., MCINROY, S. G. & MINCHIN, F. R., The structure of nitrogen fixing root nodules on the aquatic mimosoid legume *Neptunia plena*, 173  
 —, MINCHIN, F. R., SPRENT, J. I., The physiology and nitrogen-fixing capability of aquatically and terrestrially grown *Neptunia plena*: the importance of nodule oxygen supply, 181  
 JERNSTEDT, J. A., CUTTER, E. G., GIFFORD, E. M. & LU, P., Angle meristem origin and development in *Selaginella martensii*, 351  
 JEUNE, B. (see SATTLER, R.), 249  
 JONES, D. R. (see DAVIES, A.), 515  
 JUPE, S. C. & SCOTT, I. M., Gibberellin and the *pro* gene suppress peroxidase activity in elongating tomato (*Lycopersicon esculentum* Mill.) stem tissues, 33  
 KAGAN, M. L., NOVOPLANSKY, N. & SACHS, T., Variable cell lineages form the functional pea epidermis, 303  
 KAHANE, R., TEYSSENDER DE LA SERVE, B. & RANCILLAC, M., Bulbing in long-day onion (*Allium cepa* L.) cultured *in vitro*: comparison between sugar feeding and light induction, 551  
 KAMALUDDIN, M. & GRACE, J., Photoinhibition and light acclimation in seedlings of *Bischofia javanica*, a tropical forest tree from Asia, 47  
 —, GRACE, J., Acclimation in seedlings of a tropical tree, *Bischofia javanica*, following a stepwise reduction in light, 557  
 KAVI KISHOR, P. B., DIVAKAR RAO, J. & REDDY, G. M., Activity of wall-bound enzymes in callus cultures of *Gossypium hirsutum* L. during growth, 145  
 KONO, Y. (see PARDALES, J. R., Jr), 493  
 KOUL, A. K. (see SHARMA, N.), 7  
 KOUL, P. (see SHARMA, N.), 7  
 KOVACH, D. A. & BRADFORD, K. J., Temperature dependence of viability and dormancy of *Zizania palustris* var. *interior* seeds stored at high moisture contents, 297  
 KRAAK, H. L. (see BINO, R. J.), 231  
 KULL, U., HERBIG, A. & OTTO, F., Construction and economy of plant stems as revealed by use of the *Bic*-method, 327  
 LAGUDAH, E. S. (see FLOOD, R. G.), 213  
 LALONDE, S. & SAINI, H. S., Comparative requirement for endogenous ethylene during seed germination, 423  
 LANNING, F. C. & ELEUTERIUS, L. N., Silica and ash in seeds of cultivated grains and native plants, 151  
 LORENZEN, J. H. & EWING, E. E., Starch accumulation in leaves of potato (*Solanum tuberosum* L.) during the first 18 days of photoperiod treatment, 481  
 LOTITO, S. (see SERRATO-VALENTI, G.), 313  
 LOVELL, P. H. (see MCKENZIE, R. J.), 199  
 LU, P. (see JERNSTEDT, J. A.), 351  
 LUMARET, R. (see MACEIRA, N. O.), 335  
 —, (see DE HAAN, A.), 345  
 LYSHEDE, O. B., Studies on mature seeds *Cuscuta pedicellata* and *C. campestris* by electron microscopy, 365  
 MAC AN T-SAOIR, S., O'BRIEN, J. & SELBY, C., The effect of explant type on the establishment of Sitka spruce [*Picea sitchensis* (Bong.) Carr.] in culture, 161  
 MACEIRA, N. O., DE HAAN, A. A., LUMARET, R., BILLON, M. & DELAY, J., Production of 2n gametes in diploid subspecies of *Dactylis glomerata* L. 1. Occurrence and frequency of 2n pollen, 335  
 —, (see DE HAAN, A.), 345  
 MARCELIS, L. F. M., The dynamics of growth and dry matter distribution in cucumber, 487  
 MARRIOTT, C. A. & HAYSTEAD, A., The effect of lenient defoliation on the nitrogen economy of white clover: the contribution of mineral nitrogen to plant nitrogen accumulation during regrowth, 429  
 MCINROY, S. G. (see JAMES, E. K.), 173  
 MCKENZIE, R. J. & LOVELL, P. H., Perianth abscission in Montbretia (*Crococsmia × crocosmiiflora*), 199  
 MELILLO, M. T. (see PETRUZZELLI, L.), 25  
 MIDMORE, D. J. & PRANGE, R. K., Growth responses of two *Solanum* species to contrasting temperatures and irradiance levels: relations to photosynthesis, dark respiration and chlorophyll fluorescence, 13



- MINCHIN, F. R. (see JAMES, E. K.), 173, 181
- MOSJIDIS, C. O'H. (see PETERSON, C. M.), 59
- MURALITHARAN, M. S., CHANDLER, S. F. & VAN STEVENINCK, R. F. M., Effects of  $\text{Na}_2\text{SO}_4$ ,  $\text{K}_2\text{SO}_4$  and KCl on growth and ion uptake of callus cultures of *Vaccinium corymbosum* L. cv. Blue Crop, 459
- NEO, H. H. (see CLIFFORD, P. E.), 209
- NOBEL, P. S. (see ALM, D. M.), 87
- NONAKA, M. (see UEDA, K.), 113
- NOVOPLANSKY, N. (see KAGAN, M. L.), 303
- O'BRIEN, J. (see MAC AN T-SAOIR, S.), 161
- OLIVEIRA, L. M. Q. & VALIO, I. F. M., Effects of moisture content on germination of seeds of *Hancornia speciosa* Gom. (Apocynaceae), 1
- OTTO, F. (see KULL, U.), 327
- PARDALES, J. R., JR, KONO, Y., YAMAUCHI, A. & IJIMA, M., Seminal root growth in sorghum (*Sorghum bicolor*) under allelopathic influences from residues of taro (*Colocasia esculenta*), 493
- PEARCE, D. M. E., HALL, K. C. & JACKSON, M. B., The effects of oxygen, carbon dioxide and ethylene on ethylene biosynthesis in relation to shoot extension in seedlings of rice (*Oryza sativa*) and barnyard grass (*Echinochloa oryzoides*), 441
- PENNAZIO, S. & ROGGERO, P., Effects of free radical scavengers on stress ethylene in soybean leaves hypersensitively reacting to tobacco necrosis virus, 437
- PENNING DE VRIES, F. W. T. (see SUMMERFIELD, R. J.), 101
- PETERSON, C. M., MOSJIDIS, C. O'H., DUTE, R. R. & WESTGATE, M. E., A flower and pod staging system for soybean, 59
- , (see DUTE, R. R.), 263
- PETRUSZELLI, L., MELILLO, M. T., BLEVE ZACHEO, T. & TARANTO, G., Physiological and ultrastructural changes in isolated wheat embryos during salt and osmotic shock, 25
- PILBEAM, C. J. & ROBSON, M. J., Response of populations of *Lolium perenne* cv. S23 with contrasting rates of dark respiration to nitrogen supply and defoliation regime. 1. Grown as monocultures, 69
- , ROBSON, M. J., Response of populations of *Lolium perenne* cv. S23 with contrasting respiration rates to nitrogen supply and defoliation regime. 2. Grown as mixtures, 79
- PODSTOLSKI, A. (see DAWIDOWICZ-GRZEGORZEWSKA, A.), 39
- PRANGE, R. K. (see MIDMORE, D. J.), 13
- QUAGLIOTTI, L. (see SERRATO-VALENTI, G.), 313
- RAFI, M. M., EHDAIE, B. & WAINES, J. G., Quality traits, carbon isotope discrimination and yield components in wild wheats, 467
- RANCILLAC, M. (see KAHANE, R.), 551
- RAO, G. U., JAIN, A. & SHIVANNA, K. R., Effects of high temperature stress on *Brassica* pollen: viability, germination and ability to set fruits and seeds, 193
- REDDY, G. M. (see KAVI KISHOR, P. B.), 145
- ROBERTS, E. H. (see ELLIS, R. H.), 53
- , (see SUMMERFIELD, R. J.), 101
- ROBSON, M. J. (see PILBEAM, C. J.), 69, 79
- , (see CHAPMAN, D. F.), 523
- ROGGERO, P. (see PENNAZIO, S.), 437
- RYLE, G. J. A. & STANLEY, J., Effect of elevated  $\text{CO}_2$  on stomatal size and distribution in perennial ryegrass, 563
- SACHS, T. (see KAGAN, M. L.), 303
- SAINI, H. S. (see LALONDE, S.), 423
- SAKS, Y. (see SMITH, M. T.), 277
- SANDERS, G. E., COLLS, J. J. & CLARK, A. G., Physiological changes in *Phaseolus vulgaris* in response to long-term ozone exposure, 123
- SATTLER, R. & JEUNE, B., Multivariate analysis confirms the continuum view of plant Form, 249
- SCOTT, A. C. (see HEMSLEY, A. R.), 545
- SCOTT, I. M. (see JUPE, S. C.), 33
- SELBY, C. (see MAC AN T-SAOIR, S.), 161
- SEN-MANDI, S. (see DAS, G.), 497
- SERRATO-VALENTI, G., CORNARA, L., LOTITO, S. & QUAGLIOTTI, L., Seed coat structure and histochemistry of *Abelmoschus esculentus*. Chalazal region and water entry, 313
- SHANMUGANATHAN, V. & BENJAMIN, L. R., The influence of sowing depth and seed size on seedling emergence time and relative growth rate in spring cabbage (*Brassica oleracea* var. capitata L.), 273
- SHARMA, N., KOUL, P. & KOUL, A. K., Reproductive biology of *Plantago*: shift from cross- to self-pollination, 7
- SHI, L. & CLINE, M., Shoot inversion-induced ethylene production in the *diageotropica* tomato mutant, 119
- SHIVANNA, K. R. (see RAO, G. U.), 193
- SILSBURY, J. H. (see HERDINA, J.), 227
- SINGH, R. P. (see BARGALI, S. S.), 405, 413
- SINGH, S. P. (see BARGALI, S. S.), 405, 413
- SMITH, M. T., SAKS, Y. & VAN STADEN, J., Ultrastructural changes in the petals of senescing flowers of *Dianthus caryophyllus* L., 277
- SNAYDON, R. W. (see CHAPMAN, D. F.), 523
- SPRENT, J. I. (see JAMES, E. K.), 173, 181
- STANLEY, J. (see RYLE, G. J. A.), 563
- SUMMERFIELD, R. J., COLLINSON, S. T., ELLIS, R. H., ROBERTS, E. H. & PENNING DE VRIES, F. W. T., Photothermal responses of flowering in rice (*Oryza sativa*), 101
- SUTHERLAND, J. M. (see JAMES, E. K.), 173
- TARANTO, G. (see PETRUSZELLI, L.), 25
- TEYSENDEUR DE LA SERVE, B. (see KAHANE, R.), 551
- TIRLAPUR, U. K. & CRESTI, M., Computer-assisted video image analysis of spatial variations in membrane-associated  $\text{Ca}^{2+}$  and calmodulin during pollen hydration, germination and tip growth in *Nicotiana tabacum* L., 503
- UEDA, K. & NONAKA, M., Division of chloroplasts in a green alga, *Pediastrum duplex*, 113
- VALIO, I. F. M. (see OLIVEIRA, L. M. Q.), 1
- VAN PIJLEN, J. G. (see BINO, R. J.), 231

- VAN STADEN, J. (see SMITH, M. T.), 277  
VAN STEVENINCK, R. F. M. (see MURALITHARAN, M. S.), 459  
VENKAIAH, K., Development, ultrastructure and secretion of gum ducts in *Lannea coromandelica* (Houtt.) Merrill (Anacardiaceae), 449  
WAINES, J. G. (see RAFI, M. M.), 467  
WALKER, E. S. (see WARREN WILSON, J.), 135  
WARREN WILSON, J., WARREN WILSON, P. M., WALKER, E. S. & HALL, P. J., IAA amino acid conjugates induce differentiation of tracheary strands in lettuce pith explants, 135  
WARREN WILSON, P. M. (see WARREN WILSON, J.), 135  
WESTGATE, M. E. (see PETERSON, C. M.), 59  
XI, T. (see ZHOU, X.), 97  
YAMAUCHI, A. (see PARDALES, J. R., Jr), 493  
YANG, W. (see ZHOU, X.), 97  
ZHENG, Y., HE, M., HAO, S. & HUANG, B., The ultrastructural evidence on the origin of protein bodies in the rough endoplasmic reticulum of developing cotyledons of soybean, 377  
ZHOU, X., HAN, Y., YANG, W. & XI, T., Somatic embryogenesis and analysis of peroxidase in cultured lettuce (*Lactuca sativa* L.) cotyledons, 97



# Subject Index

- Abelmoschus esculentus* L. Moench, 313  
 Abscission, 59, 199  
 Accelerated aged, 497  
 Accelerated ageing, 39  
 Acetylene reduction, 227  
 Actin cytoskeleton, 385, 395  
*Aegilops* spp., 467  
*Agave deserti*, 87  
 Aleurone cells, 365  
 Allelopathic substances, 493  
 1-Aminocyclopropane-1-carboxylic acid (ACC), 441  
 Anacardiaceae, 449  
 Anatomy, 199  
 Angiosperms, 249  
 Angle meristem, 351  
 Anther, 7  
 Anthesis, 59  
 Apical cell, 351  
 Apical dominance, 237  
 Aquatic legume, 173, 181  
*Aranda* Tay Swee Eng, 209  
 Assimilate partitioning, 209, 243  
 Auxin, 119, 199  
 Axillary bud development, 515  
  
 Barnyard grass, 441  
*Betula pubescens*, 545  
 Bic-value, 327  
 Biomass, 405  
 Biomass accumulation ratio, 405  
 Biomass allocation, 487  
*Bischofia*, 557  
*Bischofia javanica*, 47  
 Blueberry, 459  
 Branching, 515, 523  
*Brassica*, 193  
*Brassica napus* L., 39  
*Brassica oleracea*, 273  
 Breakstrength, 199  
 Bulb, 551  
  
 C levels, 231  
 Ca<sup>2+</sup>-channels, 503  
 Ca<sup>2+</sup> transport ATPase, 503  
 Cabbage, 273  
 Calcium, 503  
 Callus, 145, 459  
 Calmodulin, 503  
 Carbon dioxide, 441  
 Carbon isotope discrimination, 467  
 Carbon-13 solid-state nuclear magnetic resonance, 545  
 Carbon translocation, 523  
 Carnation, 277  
 Cell determination, 303  
 Cell lineages, 303  
 Cell ultrastructure, 123  
 Cell wall changes, 199  
 Cell walls, 113, 365  
 Cellular interactions, 303  
 Chalazal region, 313  
 Chlorophylls, 557  
 Chloroplast division, 113  
 Climacteric vacuoles, 277  
 Colchicine, 395  
  
*Colocasia esculenta*, 493  
 Construction cost, 327  
 Cotyledon removal, 227  
*Crococsmia* × *crococsmiiflora*, 199  
 Crown, 161  
 Cucumber, 487  
*Cucumis sativus* L., 487  
*Cuscuta campestris*, 365  
*Cuscuta pedicellata*, 365  
 Cuticle, 365  
*Cyclamen persicum*, 327  
 Cytochalasin D, 395  
  
*Dactylis glomerata* L., 335, 345  
 Day/night temperature, 289  
 Defoliation, 79, 523  
*Diageotropica* (dgt), 119  
*Dianthus caryophyllus* L. cv. White Sim, 277  
 Diffusion model, 509  
 Diffusion resistance, 181  
 DNA content, 231  
 Dormancy, 297, 551  
 Dry matter partitioning, 273  
 Dry-matter production, 69, 79  
  
*Echinochloa oryzoides* [Ard.] Fritsch, 441  
 2n eggs, 345  
 Electrical circuit analog, 87  
 Electronprobe X-ray microanalysis, 459  
 Elevated CO<sub>2</sub>, 563  
 Embryo, 167, 365  
 Embryo development, 59  
 Enation, 249  
 Endosperm, 263, 365  
 Energy expenditure value, 327  
 Energy-dispersive X-ray analysis, 151  
*Ephedra foeminea*, 327  
 Epidermal development, 303  
 Epidermis, 151  
 ER origin, 377  
 Ethephon, 237  
 Ethylene, 119, 199, 277, 437  
 Ethylene action, 423  
 Ethylene biosynthesis, 441  
 Ethylene synthesis, 423  
*Eucalyptus tereticornis* plantation, 413  
*Eucalyptus tereticornis* Sm., 405  
  
 Faba bean, 227  
 Flow cytometry, 231, 335, 345  
 Flower, 249  
 Flower stalk, 327  
 Flowering, 101  
 Flowers, 199  
 Fluorescence, 47  
 Forest floor, 405  
 Fossil sporopollenin, 545  
 Free radicals, 437  
 Freeze-substitution, 113  
 Fruit abortion, 487  
 Fruit growth, 487  
  
 GA, 33  
 Galactomannan, 365

- Garden peas, 303  
 GC-MS, 441  
 Genotype, 481  
 Germination, 1, 25, 297, 497  
*Gib-1* mutation, 533  
 Gibberellins, 533  
 Glucanase, 145  
*Glycine max*, 263  
*Glycine max* L. Merr., 59  
*Glycine max* Merr., 437  
 Glycosidases, 145  
*Gossypium hirsutum*, 145  
 Grain yield, 219  
 Green bean, 123  
 Growing points, 515  
 Growth, 145, 523  
 Growth analysis, 13, 273  
 Growth rate, 289  
 Gum ducts, 449  
 Gum secretion, 449  
  
*Hancornia speciosa*, 1  
 Heat adaptation, 13  
*Hevea brasiliensis*, 323  
 Hexaploid wheat, 213  
 High-temperature stress, 193  
 Histochemistry, 199, 313  
 Homeosis, 249  
 Homology, 249  
*Hordeum sativum* Lam., 219  
*Hordeum vulgare* L., 237  
 Hydraulic conductivity, 87  
 Hypersensitivity, 437  
  
 IAA conjugates, 135  
 Image analysis, 503  
 Immature stomata, 303  
*In vitro* selection, 459  
 Intermediate fibres, 113  
 Internode, 219  
 Isoenzymes, 97  
  
 Jasmonic acid, 237  
 Juvenile, 161  
  
 KCl, 459  
 $K_2SO_4$ , 459  
  
*Lactuca sativa*, 135  
*Lactuca sativa* L., 97  
*Lagenicula crassiaculeata*, 545  
*Lannea coromandelica* (Houtt.) Merrill, 449  
 Lateral root, 493  
 Leaf, 249  
 Leaf appearance rate, 515  
 Leaf area, 289  
 Leakage, 39  
 Lenient defoliation, 429  
 Lettuce, 97, 135  
 Light, 13, 557  
 Light acclimation, 47  
 Light interception, 273  
 Light spectral quality, 551  
 Litter fall, 405  
*Lolium perenne*, 69, 79, 563  
*Lycopersicon esculentum*, 533  
*Lycopersicon esculentum* Mill., 231  
 Lycophyta, 351  
*Lycopodium clavatum*, 545  
  
 Malonyl-ACC, 441  
 Mature, 161  
 Membranes, 277  
  
 Meristem, 533  
 Micropropagation, 161  
 Moisture, 1  
 Moisture content, 297  
 Monocotyledons, 199  
 Monoculture, 69  
 Monopodial orchids, 209  
 Montbretia, 199  
 Morphogenesis, 351  
 Morphological categories, 249  
 Morphological continuum, 249  
 Morphology, 523  
 Mould and cast technique, 351  
  
 N accumulation, 429  
 $N_2$  fixation, 429, 227  
*Narcissus pseudonarcissus* L., 385  
*Narcissus pseudonarcissus*, 395  
 $Na_2SO_4$ , 459  
 Naturally aged, 497  
*Neptunia plena*, 173, 181  
 Net assimilation rate, 273  
 Net primary productivity, 405  
*Nicotiana tabacum* L., 503  
 Nifedipine, 395  
 Nitrate, 227  
 Nitrogen, 79  
 Nitrogen defoliation, 69  
 Nitrogen fixation, 173, 181  
 Nodulation, 227  
 Nodule activity, 227  
 Nodule number, 227  
 Nuclear replication stage, 231  
 Nutrient concentration, 413  
 Nutrient cycling, 413  
  
 Okra, 313  
 One-sided competition, 509  
*Opuntia ficus-indica*, 87  
*Oryza sativa*, 101  
*Oryza sativa* L., 21, 53, 441  
 Osmotic effects, 395  
 Osmotic stress, 25, 167  
 Ovules, 263  
 Oxygen, 173, 181  
 Oxygen shortage, 441  
 Ozone, 123  
  
*Pachysandra terminalis*, 327  
 2S,3S paclobutrazol, 533  
*Parka decipiens*, 545  
 Partial homology, 249  
 Partitioning, 481, 487  
 Pattern foundation, 303  
*Pediastrum duplex*, 113  
 Perennial ryegrass cv. S23, 69, 79  
 Perianth, 199  
 Peroxidase, 33, 323  
 Peroxidases, 97  
 Petal senescence, 277  
 Petiole length, 515  
*Phaseolus vulgaris*, 123  
 Photoinhibition, 47  
 Photoperiod, 101, 481, 551  
 Photoperiodicity, 289  
 Photosynthesis, 47, 123, 557  
 Photothermal responses, 101  
*Picea sitchensis*, 161  
*Pinus sylvestris*, 545  
*Pisum sativum*, 303  
 Pith explants, 135  
 Plant growth regulators, 237  
 Plant hormones, 423



- Plant morphology, 249
- Plantago lanceolata*, 7
- Plantago ovata*, 7
- Plantago patagonica*, 7
- Plantation, 405
- Poa pratensis* L., 289
- Pod set, 59
- 2n pollen, 335
- Pollen activation, 385, 395
- Pollen germination, 193, 385, 395, 503
- Pollen size, 335
- Pollen to ovule ratio, 7
- Pollen tube, 503
- Pollen viability, 193
- Pollen-tube wall development, 385
- Polyamines, 323
- Polyploidy, 345
- Population, 69, 79
- Post-anthesis storage, 219
- Potato, 481
- Pre-anthesis storage, 219
- Priming, 231
- Principal components analysis, 249
- pro*, 33
- Protein and lysine contents, 467
- Protein body, 377
- Protein synthesis, 167
- Protogyny, 7
- Quiescent centre, 533
- Recalcitrant seeds, 1
- Relative growth rate, 273
- Remobilization, 243
- 50:50 replacement mixture, 79
- Replica technique, 351
- Respiration, 69, 79
- R:FR ratio, 551
- Rhizobium*, 173
- Rhizomes, 289
- Rice, 53, 101, 441
- Role of Ca<sup>2+</sup> flux, 395
- Root, 249
- Root growth, 493
- Root meristem, 21
- Root nodules, 173, 181
- Roots, 289, 533
- Rubber-tree, 323
- Ryegrass, 563
- Salinity, 25
- Salt tolerance, 459
- Scanning electron microscopy, 151, 351
- Scutellar  $\alpha$  and  $\beta$  amylase, 497
- Secale cereale* L., 21
- Seed, 231, 243, 297, 365
- Seed coat, 151, 313, 365
- Seed dormancy, 423
- Seed germination, 423
- Seed longevity, 53
- Seed moisture, 53
- Seed size, 273
- Seed storage, 53
- Seedling emergence time, 273
- Seeds, 39, 151
- Selaginella martensii* Spring, 351
- SEM, 365
- Seminal root, 493
- Senescence, 199
- Sexual polyploidization, 335, 345
- Shade, 47
- Shade acclimation, 557
- Shoot, 249
- Shoot elongation, 119
- Shoot extension, 441
- Shoot inversion, 119
- Silica and ash content, 151
- Silica depositional patterns, 151
- Simulated sward, 69, 79
- Sitka spruce, 161
- Smooth meadow grass, 289
- Soil moisture, 515
- Soil temperature, 515
- Solanum tuberosum* L., cv. Norchip, 481
- Somatic embryogenesis, 97, 323
- Sorbitol, 25
- Sorghum bicolor*, 493
- Source-sink relationships, 209
- Sowing depth, 273
- Soybean, 263, 377, 437
- Spacing patterns, 303
- Specific leaf area, 273
- Spike, 243
- Spikelet number, 213
- Spring barley, 237
- Stability of population structure, 509
- Standing state, 413
- Starch accumulation, 481
- Stationary size distribution, 509
- Stem, 219, 243, 249, 327
- Stem extension, 33
- Stigma, 7
- Stomata, 303
- Stomatal distribution, 563
- Stomatal size, 563
- Storage, 1, 243, 297
- Storage protein, 377
- Stress-strain graph, 327
- Structure, 313
- [<sup>14</sup>C]Sucrose, 161
- Sugar, 551
- Symptom development, 123
- Taraxacum officinale* (dandelion), 327
- Taro, 493
- Taro residues, 493
- Taxus baccata* (yew), 327
- Telome, 249
- TEM, 365
- Temperature, 101, 481
- Thallus, 249
- Tillering, 237, 289
- Tip growth, 503
- Tip-growth system, 385
- Tissue culture, 551
- Tobacco necrosis virus, 437
- Tomato, 231, 533
- Tomato (*Lycopersicon esculentum* Mill.), 33
- Tracheary element differentiation, 135
- Transmission electron microscopy, 113
- Tree seedlings, 557
- Trichome, 249
- Trichomes, 151
- Trifolium repens*, 515, 523
- Trifolium repens* L. cv. S184, 429
- Triticum aestivum* L., 21, 497
- Triticum durum*, 167, 213
- Triticum durum* L., 25
- Triticum* spp., 467
- Triticum tauschii*, 213
- Tropical tree, 557
- Tropical trees, 47
- Turnover, 413
- Two-sided competition, 509
- Ultrastructure, 39, 277, 449

- Unaged, 497  
Unequal divisions, 303  
Uptake, 413  
*Vaccinium corymbosum*, 459  
Vacuolation, 21  
Vegetative-generative growth, 487  
Vernalization requirement, 213  
Viability equation, 53  
*Vicia faba*, 227  
Wall lysis, 277  
Water entry, 313  
Water potential, 87  
Water uptake, 167  
Weight gain, 289  
Wheat, 497  
Wheat embryo, 25  
White clover, 429, 515, 523  
Wild rice, 297  
Winter barley, 219  
Xylem strands, 135  
Yield components, 467  
Zinc, 21  
*Zizania palustris* var. *interior* (Fassett) Dore, 297